

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing (day/month/year)

14 December 2000 (14.12.00)

International application No.

PCT/IB00/00596

Applicant's or agent's file reference

CH-1998-0047

International filing date (day/month/year)

09 May 2000 (09.05.00)

Priority date (day/month/year)

12 May 1999 (12.05.99)

Applicant

DROZ, Patrick et al

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

21 October 2000 (21.10.00)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Zakaria EL KHODARY

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

REC'D 07 SEP 2001

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference CH-1998-0047	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IB00/00596	International filing date (day/month/year) 09/05/2000	Priority date (day/month/year) 12/05/1999
International Patent Classification (IPC) or national classification and IPC H04L12/56		
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 21/10/2000	Date of completion of this report 03.09.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Dechmann, J-L Telephone No. +49 89 2399 8826 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/00596

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-18	as originally filed			
2a	as received on	15/05/2001	with letter of	14/05/2001

Claims, No.:

4 (part), 5-12, 17 (part)	as originally filed			
18-21				
1-3, 4 (part)	as received on	15/05/2001	with letter of	14/05/2001
13-16, 17 (part)	as received on	15/06/2001	with letter of	12/06/2001

Drawings, sheets:

1/10-10/10	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/00596

- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-21
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-21
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-21
	No:	Claims	

2. Citations and explanations
see separate sheet

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

I

The following documents have been considered for the purposes of this report:

D1: WO-A-99/14906

D2: BELL T ET AL: 'LONGEST-MATCH STRING SEARCHING FOR ZIV-LEMPER COMPRESSION' SOFTWARE PRACTICE & EXPERIENCE, GB, JOHN WILEY & SONS LTD., CHICHESTER, vol. 23, no. 7, 1 July 1993

II

The present application is related to longest matching prefix lookup, in particular for determining, in a switching node, an output or forwarding route in response to a given search argument, such as an IP address.

The problems of today's networks are (a) the great number of different users or addresses in the system, and (b) the tremendous number of messages (packets) to be transmitted. A forwarding node (routing center) in the Internet may have to dispatch about one million messages per second.

Another challenge is the provision of differently sized "domains" of addresses. Each of the addresses used may have a fixed total length (e.g. 32 bits); whole groups of addresses having a common "prefix" are assigned to the same domain and thus require the same routing, e.g. all addresses with prefix "4.22 /16". One problem is that these domains and thus the prefixes to be considered during evaluation for routing in many systems (e.g. the Internet) have different sizes. Another problem is that there may be exceptions, i.e. the addresses of subdomains of a main domain may require different routings than the majority of addresses of the respective main domain. This requires "filtering out" those particular addresses during routing. For example, if most of

the users with addresses of the group 4.22.xxx.xxx (4.22/16) are located in the same area, the addresses of subdomain 4.22.48.xxx 4.22.55.xxx (4.22.48/20) and the addresses of another, even smaller subdomain 4.22.17.192 4.22.17.255 (4.22.17.192/26) may require routing through other links because the respective recipients (users) are located in another region.

This leads to the technique of longest matching prefix (or best matching prefix) routing which requires a respective evaluation of addresses in each forwarding node (routing center).

Several techniques were developed for effecting longest matching prefix routing. Most are based on the use of hierarchical tree like structures.

D1 discloses a method and system for fast routing lookups. In a method of IP routing lookup in a routing table, comprising entries of arbitrary length prefixes with associated next-hop information in a next-hop table, to determine where IP datagrams are to be forwarded, a representation of the routing table is stored, in the form of a complete prefix tree (7), defined by the prefixes of all routing table entries. Further, a representation of a bit vector (8) comprising data of a cut through the prefix tree (7) at a current depth (D), and an array of pointers, comprising indices to the next-hop table and to a next-level chunk, are stored. Said bit-vector (8) is divided into bit-masks and a representation of the bit-masks is stored in a maptable. Then, an array of code words, each encoding a row index into the maptable and a pointer offset, and an array of base addresses are stored. Finally, the lookup is performed. This scheme does not support fast incremental updates resulting in low update rates.

D2 presents eight data structures that can be used to accelerate the searching, including adaptations of four methods normally used for exact matching searching. Hashing, binary search trees, searching algorithm are traditionally used to search for exact matches, but it is shown how these can be adapted to find longest matches. These algorithms require more memory to store a routing table of a given size.

It is the object of the invention to devise a method (independent claim 1) and data structure design (independent claim 14) for finding a longest matching prefix for a given input address or search argument, in a multiple-level arrangement of stored tables, which requires only a few lookup operations per search, has moderate storage requirements, and allows a flexible adaptation of the stored data structure to the distribution of used prefixes in a system.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IB00/00596

The invention allows, in particular, the use of variable-length segments of the given search argument as either test values or addressing indexes, and also a combination of testing followed by indexed accessing with such variable-length segments, during the lookup procedure for detection of longest matching prefixes and their assigned output indications.

None of these disclosed methods and systems allows to use search argument segments of selectable length partially as testing values and partially as addressing indexes in a flexible combination, for finding longest matching prefixes in a multiple-table structure having entries with varying, different access criteria.

An inventive step is therefore acknowledged and claims 1-21 meet the requirements of Article 33(3) PCT.

- Replacement sheet -

- 2a -

WO 99/14906 discloses a method and system for fast routing lookups. In a method of IP routing lookup in a routing table, comprising entries of arbitrary length prefixes with associated next-hop information in a next-hop table, to determine where IP datagrams are to be forwarded, a representation of the routing table is stored, in the form of a complete prefix
5 tree (7), defined by the prefixes of all routing table entries. Further, a representation of a bit vector (8) comprising data of a cut through the prefix tree (7) at a current depth (D), and an array of pointers, comprising indices to the next-hop table and to a next-level chunk, are stored. Said bit-vector (8) is divided into bit-masks and a representation of the bit-masks is stored in a maptable. Then, an array of code words, each encoding a row index into the
10 maptable and a pointer offset, and an array of base addresses are stored. Finally, the lookup is performed. This scheme does not support fast incremental updates resulting in low update rates.

T. Bell and D. Kulp present in the article "Longest-match String Searching for Ziv-Lempel Compression", SOFTWARE PRACTICE & EXPERIENCE, GB, JOHN WILEY & SONS
15 LDT., CHICHESTER, vol. 23, no. 7, 12 July 1993, pages 757-771, XP000655855, ISSN: 0038-0644, eight data structures that can be used to accelerate the searching, including adaptations of four methods normally used for exact matching searching. Hashing, binary search trees, splay trees and the Boyer-Moore searching algorithm are traditionally used to search for exact matches, but it is shown how these can be adapted to find longest matches.
20 These algorithms require more memory to store a routing table of a given size.

- Replacement sheet -

- 19 -

CLAIMS

- 1) Method for determining an output in response to a given input search argument, based on longest matching prefix selection and using lookup operations in a multiple-level arrangement of node tables;
- 5 wherein, in successive steps, table entries in node tables of successive levels are interrogated until an end indication is found; in which method starting with a selected segment of the search argument having individually determinable length which is used as index for accessing a first entry in a first level of the node tables, depending on the table entry which comprises an operation indication (F1, F2) and until a last
- 10 entry is found the next search at the next level is performed by one of the following:
- (a) a test using a selection information (CNT) to selected a further segment;
 - (b) an index using the selection information (CNT) to define the selected segment that constitutes the index;
 - (c) the test followed by the index using the selection information (CNT1, CNT2).
- 15 2) Method as in claim 1, wherein the selection and accessing of a node table entry is effected by
- a table base pointer (PTR) identifying a node table containing an entry to be subsequently accessed, and
 - an offset value.
- 20 3) Method as in claim 2, wherein the offset value is determined:
- EITHER by a segment (index) of the search argument, said segment being selected in response to selection information (CNT) contained in the respective entry;
 - OR by the binary test result of a comparison between a stored test value (TV) and a selected segment (test argument) of the search argument.
- 25 4) Method as in claim 2, wherein the offset value is determined in response to the binary test result of a comparison between a test value stored in a node table entry and a selected segment of the search argument, and that

- 22 -

13) Method as in claim 11, wherein

- said other selected segment is equal to or includes the previously used test argument segment.

14) Stored data structure comprising node tables each having plural entries, in a system for
5 determining an output in response to a given input search argument, based on longest matching prefix selection and using lookup operations in a multiple-level arrangement of node tables;

- in which each node table entry is either accessed in response to a selected segment of the search argument, which is used as a table index, or is accessed directly in response to the
10 result of a comparing test operation;

said node table entries including basic entries, each holding at least

- an operation indication (F1, F2) that allows the selection of at least one of the following:
a test, an index, a test followed by an index, a last entry;

- a selection information (CNT; CNT 1, CNT2) for selecting a segment of the search
15 argument to be used as the table index and/or the test operation when the operation indication (F1, F2) does not correspond to the last entry; and

- a table base pointer (PTR) identifying the next node table to be used.

15) Stored data structure as in claim 14, further comprising:

- a test value (TV) to be compared to a selected segment of the search argument; or
20 - an end indication (END) which is either an output indicator (NHP) or a stop indicator (NIL).

16) Stored data structure as in claim 14, wherein a basic entry may additionally include:

- second selection information (CNT2) for extracting a further segment from the search argument during processing of the same entry.

25 17) Stored data structure as in claim 14, wherein at least some of the basic entries in a node table contain:

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference CH-1998-0047	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/IB 00/ 00596	International filing date (day/month/year) 09/05/2000	(Earliest) Priority Date (day/month/year) 12/05/1999

Applicant

INTERNATIONAL BUSINESS MACHINES CORPORATION et al.

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

1
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 00/00596

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99 14906 A (EFFICIENT NETWORKING AB) 25 March 1999 (1999-03-25) page 9, line 1 -page 10, line 30 figures 2,3 abstract	1, 14
A	BELL T ET AL: "LONGEST-MATCH STRING SEARCHING FOR ZIV-LEMPER COMPRESSION" SOFTWARE PRACTICE & EXPERIENCE, GB, JOHN WILEY & SONS LTD. CHICHESTER, vol. 23, no. 7, 1 July 1993 (1993-07-01), pages 757-771, XP000655855 ISSN: 0038-0644 page 759 -page 764	1, 14

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

4 August 2000

Date of mailing of the international search report

11/08/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Canosa Aresté, C

Information on patent family members

PGF/IB 00/00596

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WÖ 9914906 A	25-03-1999	AU 7463198 A	05-04-1999
		EP 1016245 A	05-07-2000
		NO 20001309 A	02-05-2000

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/00854

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	IBM Disclosure Bulletin, Volume 40, No 3, March 1997, ., "Technique for Performing Generalized Prefix Matches" page 189 - page 200 --	1,2
A	SIAM Journal Computers, Volume 17, No 6, December 1988, Kurt Mehlhorn et al, "A LOWER BOUND ON THE COMPLEXITY OF THE UNION-SPLIT-FIND PROBLEM" page 1093 - page 1102 -- -----	1,2

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/00854

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04L 12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EDOC, WPIL, JAPIO, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Mikael Degermark, "TREE ASPECTS OF PACKET FORWARDING IN THE INTERNET", April 1997, (Luleå Tekniska Högskola, Sweden), page 27 - page 44, Doctoralthesis --	1,2
A	Infocom, Volume 3, 1993, (Morristown, USA) Anthony J. McAuley & Paul Francis, "Fast Routing Table Lookup Using CAMs" --	1,2
A	IBM Technical Disclosure Bulletin, Volume 36, No 2, February 1993, ., "Memory Organization Scheme for the Implementation of Routing Tables in High Performance IP Routers" page 151 - page 153 --	1,2

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier document but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

19 October 1998

Date of mailing of the international search report

25 -10- 1998

Name and mailing address of the ISA/
 Swedish Patent Office
 Box 5055, S-102 42 STOCKHOLM
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Authorized officer

Anders Ströbeck

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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF RECEIPT OF
RECORD COPY

(PCT Rule 24.2(a))

From the INTERNATIONAL BUREAU

To:

WILLIAMS, Julian, David
International Business Machines
Corporation
Saeumerstrasse 4
CH-8803 Rueschlikon
SUISSE

14L2H13JUN'00 09:23

Date of mailing (day/month/year) 29 May 2000 (29.05.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference CH-1998-0047	International application No. PCT/IB00/00596

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

INTERNATIONAL BUSINESS MACHINES CORPORATION (for all designated States except
US)

DROZ, Patrick et al (for US)

International filing date : 09 May 2000 (09.05.00)
Priority date(s) claimed : 12 May 1999 (12.05.99)
Date of receipt of the record copy
by the International Bureau : 10 May 2000 (10.05.00)
List of designated Offices :

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
National : JP, KR, US

ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase
☒ confirmation of precautionary designations
☐ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer: Dominique DELMAS
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. **It is the applicant's responsibility** to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

WILLIAMS, Julian, David
International Business Machines
Corporation
Saeumerstrasse 4
CH-8803 Rueschlikon
SUISSE

Date of mailing (day/month/year) 29 May 2000 (29.05.00)	
Applicant's or agent's file reference CH-1998-0047	IMPORTANT NOTIFICATION
International application No. PCT/IB00/00596	International filing date (day/month/year) 09 May 2000 (09.05.00)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 12 May 1999 (12.05.99)
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
12 May 1999 (12.05.99)	99810421.0	EP	10 May 2000 (10.05.00)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer Dominique DELMAS Telephone No. (41-22) 338.83.38
--	---

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

To:
INTERNATIONAL BUSINESS MACHINES
CORP.
Attn: WILLIAMS, David J.
Säumerstraße 4
CH-8803 Rüschlikon
SWITZERLAND

IPL2H 1AUG'00 14:25

Date of mailing
(day/month/year) 11/08/2000

Applicant's or agent's file reference

CH-1998-0047

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.

PCT/IB 00/ 00596

International filing date
(day/month/year)

09/05/2000

Applicant

INTERNATIONAL BUSINESS MACHINES CORPORATION et al.

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Theresia Van Deursen

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference CH-1998-0047	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, Item 5 below.	
International application No. PCT/IB 00/ 00596	International filing date (day/month/year) 09/05/2000	(Earliest) Priority Date (day/month/year) 12/05/1999
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

1



None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/IB 00/00596

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99 14906 A (EFFICIENT NETWORKING AB) 25 March 1999 (1999-03-25) page 9, line 1 -page 10, line 30 figures 2,3 abstract	1, 14
A	--- BELL T ET AL: "LONGEST-MATCH STRING SEARCHING FOR ZIV-LEMPER COMPRESSION" SOFTWARE PRACTICE & EXPERIENCE, GB, JOHN WILEY & SONS LTD. CHICHESTER, vol. 23, no. 7, 1 July 1993 (1993-07-01), pages 757-771, XP000655855 ISSN: 0038-0644 page 759 -page 764 -----	1, 14

☐ Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

4 August 2000

Date of mailing of the international search report

11/08/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Canosa Aresté, C

Information on patent family members

101/IB 00/00596

Form PCT/ISA/210 (patent family annex) (July 1992)

TENT COOPERATION TREATY

→ TKR

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

WILLIAMS, David J.
INTERNATIONAL BUSINESS MACHINES
CORP.
Säumerstraße 4
CH-8803 Rüschlikon
SUISSE

cc: VOG

WRITTEN OPINION

TERMIN: 16 MAY 2001
(PCT Rule 66)

Date of mailing (day/month/year) 16.02.2001	
Applicant's or agent's file reference CH-1998-0047	REPLY DUE within 3 month(s) from the above date of mailing
International application No. PCT/IB00/00596	International filing date (day/month/year) 09/05/2000
Priority date (day/month/year) 12/05/1999	
International Patent Classification (IPC) or both national classification and IPC H04L12/56	
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al.	

1. This written opinion is the **first** drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☐ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain document cited
 - VII ☒ Certain defects in the international application
 - VIII ☒ Certain observations on the international application
3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 12/09/2001.

Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer / Examiner Dechmann, J-L Formalities officer (incl. extension of time limits) Ahrens, R Telephone No. +49 89 2399 8136
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10/031811
531 PCT 13 NOV 2001

IBM Research
Zurich Research Laboratory
Intellectual Property Department
Säumerstrasse 4 / Postfach
CH-8803 Rüschlikon, Switzerland
Tel. Switchboard +41(01)724 8111
Fax +41(01)724 8951

European Patent Office
D-80298 Munich

June 12, 2001

Applicant:	International Business Machines Corporation et al.	
Intl. Application No.:	PCT/IB00/00596	
Intl. Filing Date:	9 May 2000	
Our Reference:	CH9-1998-0047	tkr

Dear Sirs,

In response to the Written Opinion dated 25 May 2001, the Applicant submits the revision to the claim set out below. For the avoidance of doubt, the revisions are submitted without prejudice and without abandonment of subject matter.

Claim:

Replace claims 14 with New Claim 14.

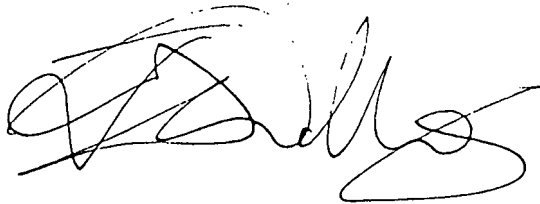
Claim 14 has been revised taking into account Examiner's observations such that it becomes clear. In particular, the New Claim 14 has been revised to fulfill the requirements of Article 6 PCT, Rule 6(3)(b) PCT, and Rule 13 PCT. The sentence which mentions that each node table entry is either accessed with an index or with a test has been put into the New Claim 14 again. The New Claim 14 specifies that the operation indication allows the selection of a test, an index, a test followed by an index, or a last entry.

Support for New claim 14 is provided in originally filed claim 14, together with page 8, lines 19, 20 and page 9, the first six lines of the description.

Should Examiner, however, intend to issue a negative IPER, Applicants herewith respectfully request a personal interview and is willing to amend the claims should this prove necessary.

If the Examiner should find a discussion at the telephone helpful, he should not hesitate to call the undersigned under 0041-1-724 8456.

Yours faithfully,



Julian D. Williams
Representative

Encl. : - Replacement sheet (in triplicate)

WRITTEN OPINION

International application No. PCT/IB00/00596

I. Basis of the opinion

1. This opinion has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".*):

Description, pages:

1-18 as originally filed

Claims, No.:

1-21 as originally filed

Drawings, sheets:

1/10-10/10 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

WRITTEN OPINION

International application No. PCT/IB00/00596

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

VII. Certain defects in the international application

I

The following documents are mentioned for the first time in this written opinion; the numbering will be adhered to in the rest of the procedure:

D1: WO-A-99/14906

D2: BELL T ET AL: 'LONGEST-MATCH STRING SEARCHING FOR ZIV-LEMPER COMPRESSION', SOFTWARE PRACTICE & EXPERIENCE, GB, JOHN WILEY & SONS LTD., CHICHESTER, vol. 23, no. 7, 1 July 1993, pages 757-771, XP000655855, ISSN: 0038-0644

II

1. To meet the requirements of Rule 6.3(b) PCT, the independent claims should be properly cast in the two-part form, with those features which in combination are part of the prior art, being placed in the preamble.
2. To meet the requirements of Rule 5.1(a)(ii) PCT, documents D1 and D2 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.
3. In order to fulfil the requirements of Rule 5.1(a)(iii) PCT, the description should be brought into conformity with the new claims.

4. The Applicant is requested to file amendments by way of replacement pages. He should also take into account the requirements of Rule 66.8 PCT. In particular, fair copies of the amendments should preferably be filed in triplicate.
5. The attention of the Applicant is however drawn to the fact that the application may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as filed, Article 34(2)(b) PCT.

VIII. Certain observations on the international application

1. Claim 1 lacks clarity in that it does not specify that the first step of the search method is always an **index** step to access the first entry in the first level of the node tables and that, depending on the current table entry which contains operation indications (F1, F2), the next search will be:
 - (a) a **test** to be made using a selection information (the CNT field) of the entry to select a further segment or
 - (b) an **index**, using a selection information (the CNT field) to define the selected segment that will constitute the index
 - (c) a **test followed by an index** using two CNT fields
 - (d) a **last** entry

and that the succeeding searches steps in the other levels of the node tables will follow the same principal until the end indication is found.

Indeed with the present formulation it is not understood how the next step is decided in the different levels of node tables

Since claim 1 does not contain this essential technical feature, it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6(3)(b) PCT that any independent claim must contain all the technical features essential to the invention.

1b. This opinion is also corroborated by the fact that without these essential technical features there is a lack of unity (Rule 13 PCT) between the data structure and the method for searching in this data structure. It is indeed not clear from the formulation of claim 1 that the particular entries of the different levels in the data structure have an influence on the search method. Claim 1 specifies the concept of index and test and claim 14 specifies some of the entries. However, the special technical features linking the two inventions is not clearly defined.

2. Independent claim 14 is also lacks clarity in that it mentions that each node table entry is either accessed with an index or with a test but it does not specify how this choice of operation is implemented. Moreover it should be mentioned that it is actually with an index **and/or** a test because both are also possible. In other words, it should be specified in the claim that this selection between test, index or test plus index is given by the basic entry "operation indication" (F1, F2) and that the extraction of the further segment to be used as an index or a test argument is made with the entry "selection information" (CNT).

F1, F2

Furthermore the additional entries (TV, NHP, NIL) should all be specified. In other words it should be specified in the independent claim what they are and what are they used for.

Confirmation

10/031811
531 Rec'd PCT/PT 13 NOV 2001
IBM Research
Zurich Research Laboratory
Intellectual Property Department
Säumerstrasse 4 / Postfach
CH-8803 Rüschlikon, Switzerland
Tel. Switchboard +41(01)724 8111
Fax +41(01)724 8951

European Patent Office
D-80298 Munich

PCT Chapter II
MU DG2

May 14, 2001

Applicant: International Business Machines Corporation et al.
Intl. Application No.: PCT/IB00/00596
Intl. Filing Date: 9 May 2000
Our Reference: CH9-1998-0047 tkr

Dear Sirs,

In response to the Written Opinion dated 16 February 2001, the Applicant submits the revision to the description and claims set out below. For the avoidance of doubt, these revisions are submitted without prejudice and without abandonment of subject matter. The Applicant thanks the Examiner for his suggestions.

Claims:

Replace claims 1,14, and 15 with New Claims 1,14, and 15.

Description:

Introduce New page 2a between page 2 and 3.

The documents D1 and D2 have been identified and discussed in the description.

Claim 1 has been revised taking into account Article 6 PCT and the Examiner's observations such that claim 1 specifies that the first step of the search method is an index step to access the first entry in the first level of the node tables and that, depending on the table entry which comprises an operation indication (F1, F2) and until a last entry (0, 0) is found the next search at the next level is performed by one of the following:

- (a) a test using a selection information (CNT) to selected a further segment;
- (b) an index using the selection information (CNT) to define the selected segment that constitutes the index;
- (c) the test followed by the index using the selection information (CNT1, CNT2).

As the method in the present formulation runs until the last entry (0, 0) is found, the end indication is clearly defined. Support for new claim 1 is provided in originally filed claim 1, together with the pages 5, 8 to 11 of the description and the figures.

Claim 14 has been revised such that it becomes clear. It is specified how the choice of operation is implemented, i.e. that it is actually with an index and/or a test because both are possible. It is stated that the node table entries include basic entries, each holding at least an operation indication (F1, F2) for indicting the operation to be performed, a selection information (CNT; CNT 1, CNT2) for selecting a segment of the search argument to be used as an index and/or a test argument, and a table base pointer (PTR) identifying the next node table to be used.

The additional entries are specified in the dependent claims. Support for new claim 14 is provided in originally filed claim 14, together with page 8, lines 19, 20 of the description.

Claim 15 has been adapted to the new claim 14 in that the phrase "wherein each additional entry holds one of the following" has been replaced by "further comprising".

In view of the multiple designated states in the present application and their different law in interpreting independent claims, the Applicant desires to maintain the one-part form of the independent claims.

Zurich Research Laboratory
Intellectual Property Department

Should Examiner, however, intend to issue a negative IPER, Applicants herewith respectfully request a personal interview and is willing to amend the claims should this prove necessary. If the Examiner should find a discussion at the telephone helpful, he should not hesitate to call the undersigned under 0041-1-724 8456.

Yours faithfully,



Julian D. Williams
Representative

Encl. : - Revised Claims (2 pages in triplicate);
- Revised description (page 2a in triplicate)

CLAIMS

- 1) Method for determining an output in response to a given input search argument, based on longest matching prefix selection and using lookup operations in a multiple-level arrangement of node tables;
- 5 wherein, in successive steps, table entries in node tables of successive levels are interrogated until an end indication is found; in which method starting with a selected segment of the search argument having individually determinable length which is used as index for accessing a first entry in a first level of the node tables, depending on the table entry which comprises an operation indication (F1, F2) and until a last
- 10 entry is found the next search at the next level is performed by one of the following:
- (a) a test using a selection information (CNT) to selected a further segment;
 - (b) an index using the selection information (CNT) to define the selected segment that constitutes the index;
 - (c) the test followed by the index using the selection information (CNT1, CNT2).
- 15 2) Method as in claim 1, wherein the selection and accessing of a node table entry is effected by
- a table base pointer (PTR) identifying a node table containing an entry to be subsequently accessed, and
 - an offset value.
- 20 3) Method as in claim 2, wherein the offset value is determined:
- EITHER by a segment (index) of the search argument, said segment being selected in response to selection information (CNT) contained in the respective entry;
 - OR by the binary test result of a comparison between a stored test value (TV) and a selected segment (test argument) of the search argument.
- 25 4) Method as in claim 2, wherein the offset value is determined in response to the binary test result of a comparison between a test value stored in a node table entry and a selected segment of the search argument, and that

14. Mai 2008

13) Method as in claim 11, wherein

- said other selected segment is equal to or includes the previously used test argument segment.

14) Stored data structure comprising node tables each having plural entries, in a system for
5 determining an output in response to a given input search argument, based on longest matching prefix selection and using lookup operations in a multiple-level arrangement of node tables;

said node table entries including basic entries, each holding at least

- an operation indication (F1, F2) for indicting the operation to be performed;

10 - a selection information (CNT; CNT 1, CNT2) for selecting a segment of the search

argument to be used as an index and/or a test argument; and

- a table base pointer (PTR) identifying the next node table to be used.

15) Stored data structure as in claim 14, further comprising:

- a test value (TV) to be compared to a selected segment of the search argument; or

15 - an end indication (END) which is either an output indicator (NHP) or a stop indicator (NIL).

16) Stored data structure as in claim 14, wherein a basic entry may additionally include:

- second selection information (CNT2) for extracting a further segment from the search argument during processing of the same entry.

20 17) Stored data structure as in claim 14, wherein at least some of the basic entries in a node table contain:

WO 99/14906 discloses a method and system for fast routing lookups. In a method of IP routing lookup in a routing table, comprising entries of arbitrary length prefixes with associated next-hop information in a next-hop table, to determine where IP datagrams are to be forwarded, a representation of the routing table is stored, in the form of a complete prefix tree (7), defined by the prefixes of all routing table entries. Further, a representation of a bit vector (8) comprising data of a cut through the prefix tree (7) at a current depth (D), and an array of pointers, comprising indices to the next-hop table and to a next-level chunk, are stored. Said bit-vector (8) is divided into bit-masks and a representation of the bit-masks is stored in a maptable. Then, an array of code words, each encoding a row index into the maptable and a pointer offset, and an array of base addresses are stored. Finally, the lookup is performed. This scheme does not support fast incremental updates resulting in low update rates.

T. Bell and D. Kulp present in the article "Longest-match String Searching for Ziv-Lempel Compression", SOFTWARE PRACTICE & EXPERIENCE, GB, JOHN WILEY & SONS LTD., CHICHESTER, vol. 23, no. 7, 12 July 1993, pages 757-771, XP000655855, ISSN: 0038-0644, eight data structures that can be used to accelerate the searching, including adaptations of four methods normally used for exact matching searching. Hashing, binary search trees, splay trees and the Boyer-Moore searching algorithm are traditionally used to search for exact matches, but it is shown how these can be adapted to find longest matches.

These algorithms require more memory to store a routing table of a given size.

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: **TKR**
WILLIAMS, David J.
INTERNATIONAL BUSINESS MACHINES
CORP.
Säumerstraße 4
CH-8803 Rüschlikon
SUISSE

WPTS ✓
DL adi ✓
vog

PCT

WRITTEN OPINION

TERMIN: 25 JUL 2001
(PCT Rule 66)

Date of mailing (day/month/year) 25.05.2001	
Applicant's or agent's file reference CH-1998-0047	REPLY DUE within 2 month(s) from the above date of mailing
International application No. PCT/IB00/00596	International filing date (day/month/year) 09/05/2000
Priority date (day/month/year) 12/05/1999	
International Patent Classification (IPC) or both national classification and IPC H04L12/56	
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al.	


1. This written opinion is the **second** drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☐ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain document cited
 - VII ☐ Certain defects in the international application
 - VIII ☒ Certain observations on the international application
3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **12/09/2001**.

Name and mailing address of the international preliminary examining authority:
 European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer / Examiner

Dechmann, J-L

Formalities officer (incl. extension of time limits)
Barrio Baranano, A
Telephone No. +49 89 2399 8621



WRITTEN OPINION

International application No. PCT/IB00/00596

I. Basis of the opinion

1. With regard to the **elements** of the international application (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"):

Description, pages:

1-18	as originally filed		
2a	as received on	15/05/2001	with letter of 14/05/2001

Claims, No.:

4 (part), 5-12, 17 (part), 18-21	as originally filed		
1-3, 4 (part), 13-16, 17 (part)	as received on	15/05/2001	with letter of 14/05/2001

Drawings, sheets:

1/10-10/10	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence

WRITTEN OPINION

International application No. PCT/IB00/00596

listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

WRITTEN OPINION
SEPARATE SHEET

International application No. PCT/IB00/00596

VIII. Certain observations on the international application

- 1a. Independent claim 14 still lacks clarity in that although the basic entries have now been specified (i.e. how the choice of operation is implemented), it does not mention anymore that each node table entry is either accessed with an index or with a test. Indeed the sentence "...in which each node table entry is either accessed in response to a selected segment of the search argument, which is used as a table index, or is accessed directly...." is not to be found anymore in the new claim 14)

In other words the claim now specifies how the **choice** of operations is implemented but it does not specify anymore to **which** operations it refers. For example the actual formulation: "an operation indication (F1, F2) for indicating the operation to be performed" does not indicate which type of operations is meant.

In particular, it should here be specified that the basic entry "operation indication" (F1, F2) allows the selection between a **test**, an **index** or a **test plus an index** or a **last** entry.

The extraction of the **further** segment (if F1F2 does not correspond to a last entry) to be used as an index or a test argument is made with the entry "selection information" (CNT).

Since claim 14 does not contain this essential technical feature, it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6(3)(b) PCT that any independent claim must contain all the technical features essential to the invention.


- 1b. This opinion is also corroborated by the fact that without these essential technical features there is a lack of unity (Rule 13 PCT) between the data structure and the method for searching in this data structure. It is indeed not clear from the formulation of claim 14 that the particular entries of the different levels in the data structure have an influence on the search method. Claim 14 should specify the concept of index and test. Without these special technical features the inventive concept linking claims 1 and 14 is not clearly defined.

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:


 WILLIAMS, Julian, David
 International Business Machines
 Corporation
 Saeumerstrasse 4
 CH-8803 Rueschlikon
 SUISSE

Date of mailing (day/month/year) 27 October 2000 (27.10.00)	
Applicant's or agent's file reference CH-1998-0047	IMPORTANT NOTIFICATION
International application No. PCT/IB00/00596	International filing date (day/month/year) 09 May 2000 (09.05.00)

1. The following indications appeared on record concerning:		
<input checked="" type="checkbox"/> the applicant	<input checked="" type="checkbox"/> the inventor	<input type="checkbox"/> the agent <input type="checkbox"/> the common representative
Name and Address DROZ, Patrick Talackerstrasse 73 CH-8152 Glattbrugg Switzerland	State of Nationality CH	State of Residence CH
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
<input type="checkbox"/> the person	<input type="checkbox"/> the name	<input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence
Name and Address DROZ, Patrick Alte Landstrasse 105 CH-8803 Rueschlikon Switzerland	State of Nationality CH	State of Residence CH
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned	
<input checked="" type="checkbox"/> the International Searching Authority	<input type="checkbox"/> the elected Offices concerned	
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Dominique DELMAS
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

WILLIAMS, Julian, David
International Business Machines
Corporation
Saeumerstrasse 4
CH-8803 Rueschlikon
SUISSE

Date of mailing (day/month/year) 23 November 2000 (23.11.00)		
Applicant's or agent's file reference CH-1998-0047		IMPORTANT NOTICE
International application No. PCT/IB00/00596	International filing date (day/month/year) 09 May 2000 (09.05.00)	
Priority date (day/month/year) 12 May 1999 (12.05.99)		
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

EP,JP

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 23 November 2000 (23.11.00) under No. WO 00/70832

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INFORMATION CONCERNING ELECTED
OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

From the INTERNATIONAL BUREAU

To:

WILLIAMS, Julian, David
International Business Machines
Corporation
Saeumerstrasse 4
CH-8803 Rueschlikon
SUISSE

Date of mailing (day/month/year) 14 December 2000 (14.12.00)		
Applicant's or agent's file reference CH-1998-0047		IMPORTANT INFORMATION
International application No. PCT/IB00/00596	International filing date (day/month/year) 09 May 2000 (09.05.00)	Priority date (day/month/year) 12 May 1999 (12.05.99)
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al		

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
National : JP, KR, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

None

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. (41-22) 740.14.35</p>	<p>Authorized officer: Zakaria EL KHODARY</p> <p>Telephone No. (41-22) 338.83.38</p>
---	--

13) Method as in claim 11, wherein

- said other selected segment is equal to or includes the previously used test argument segment.

14) Stored data structure comprising node tables each having plural entries, in a system for
5 determining an output in response to a given input search argument, based on longest matching prefix selection and using lookup operations in a multiple-level arrangement of node tables;

- in which each node table entry is either accessed in response to a selected segment of the search argument, which is used as a table index, or is accessed directly in response to the
10 result of a comparing test operation;

- said node table entries including:

a) basic entries; each holding at least

- an operation indication (F1, F2),
15 - a selection information (CNT) for selecting a segment of the search argument, and
- a table base pointer (PTR) identifying the next node table to be used;

AND

b) additional entries (TV, NHP, NIL).

15) Stored data structure as in claim 14, wherein each additional entry holds one of the
20 following:

- an end indication (END) which is either an output indicator (NHP) or a stop indicator (NIL); or

- a test alue (TV) to be compared to a selected segment of the search argument.

16) Stored data structure as in claim 14, wherein a basic entry may additionally include:

25 - second selection information (CNT2) for extracting a further segment from the search argument during processing of the same entry.

17) Stored data structure as in claim 14, wherein at least some of the basic entries in a node table contain:

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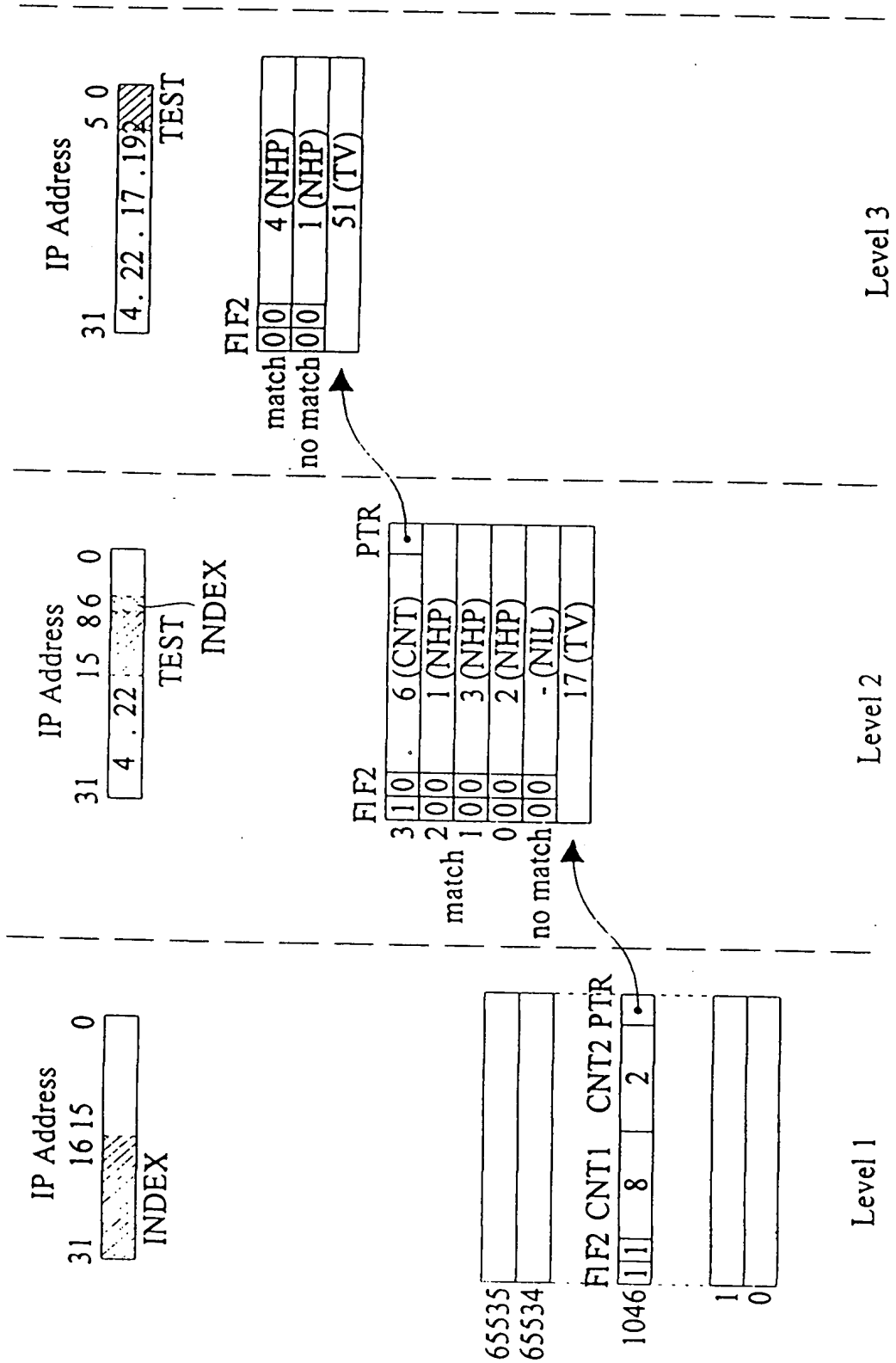
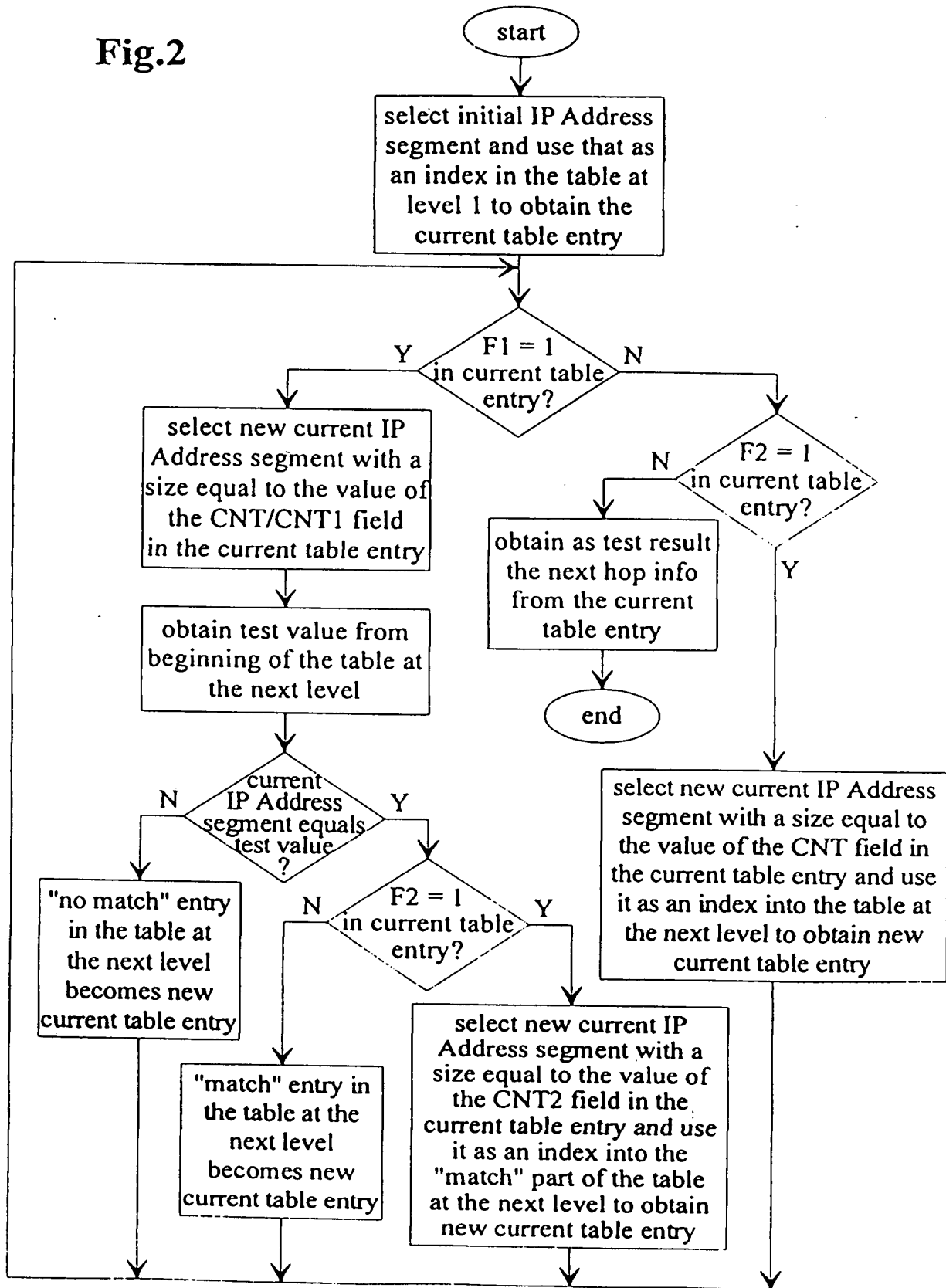


Fig.1

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Fig.2



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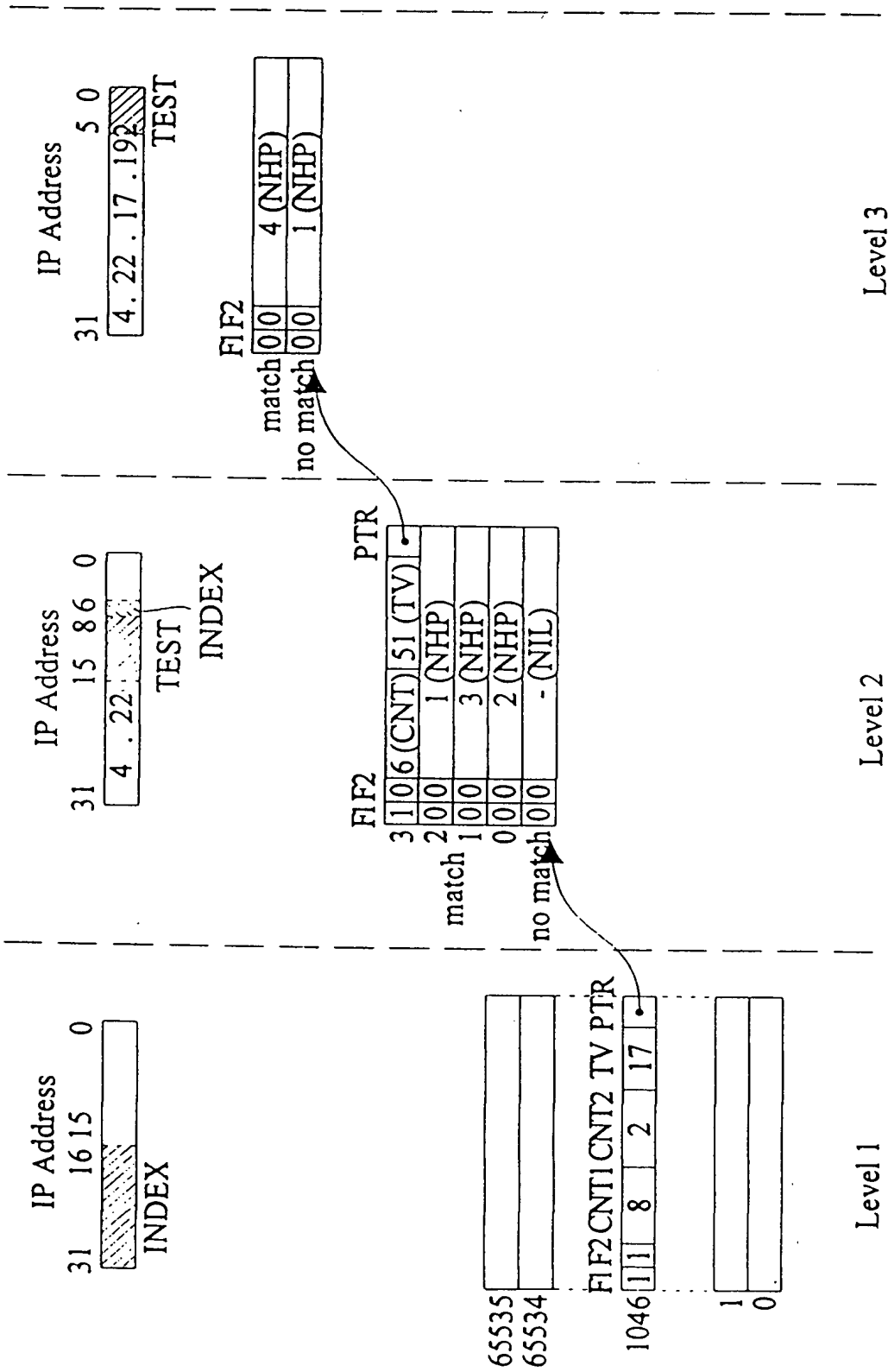


Fig.3

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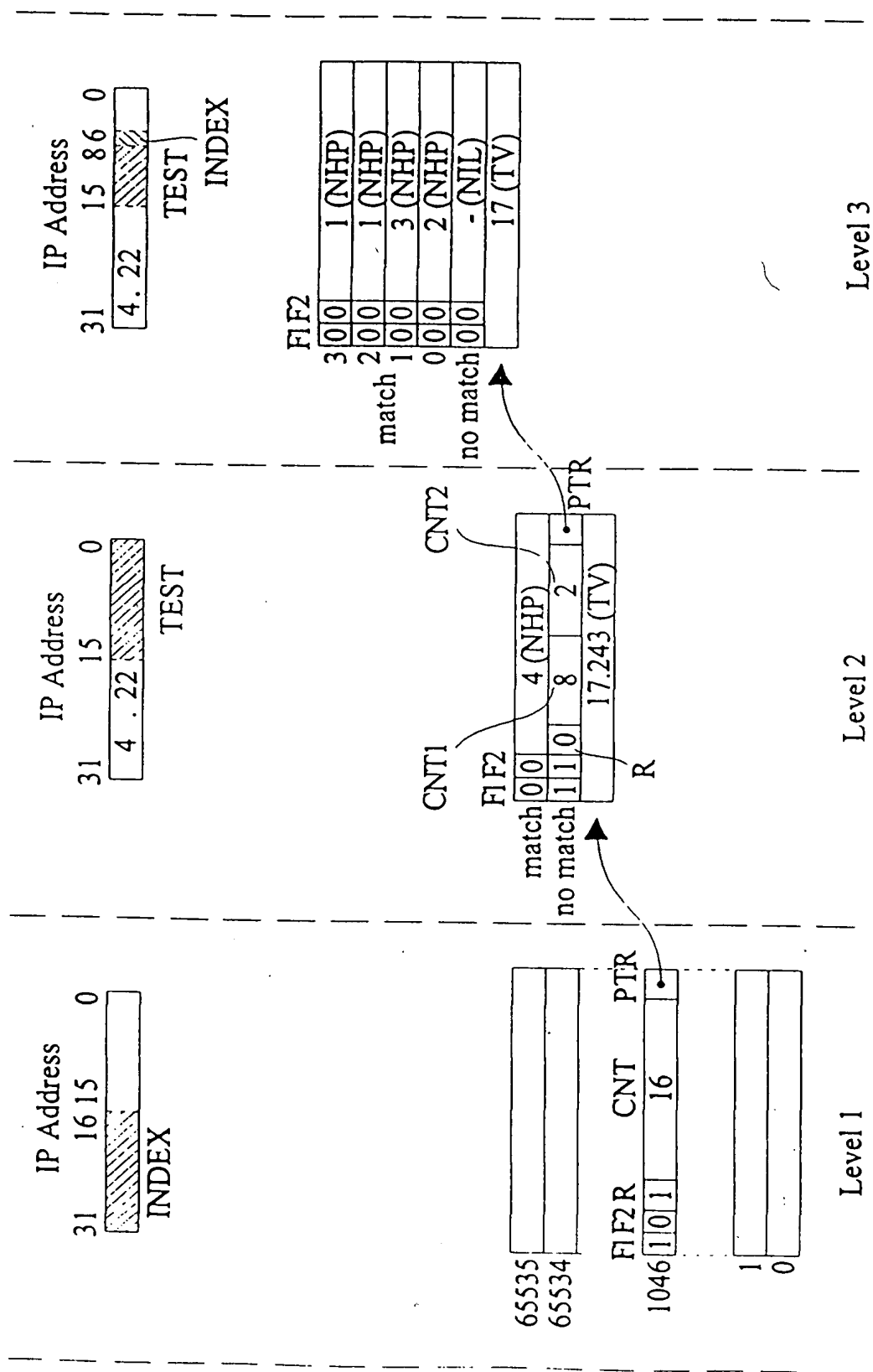


Fig.4

CH-1998-0047

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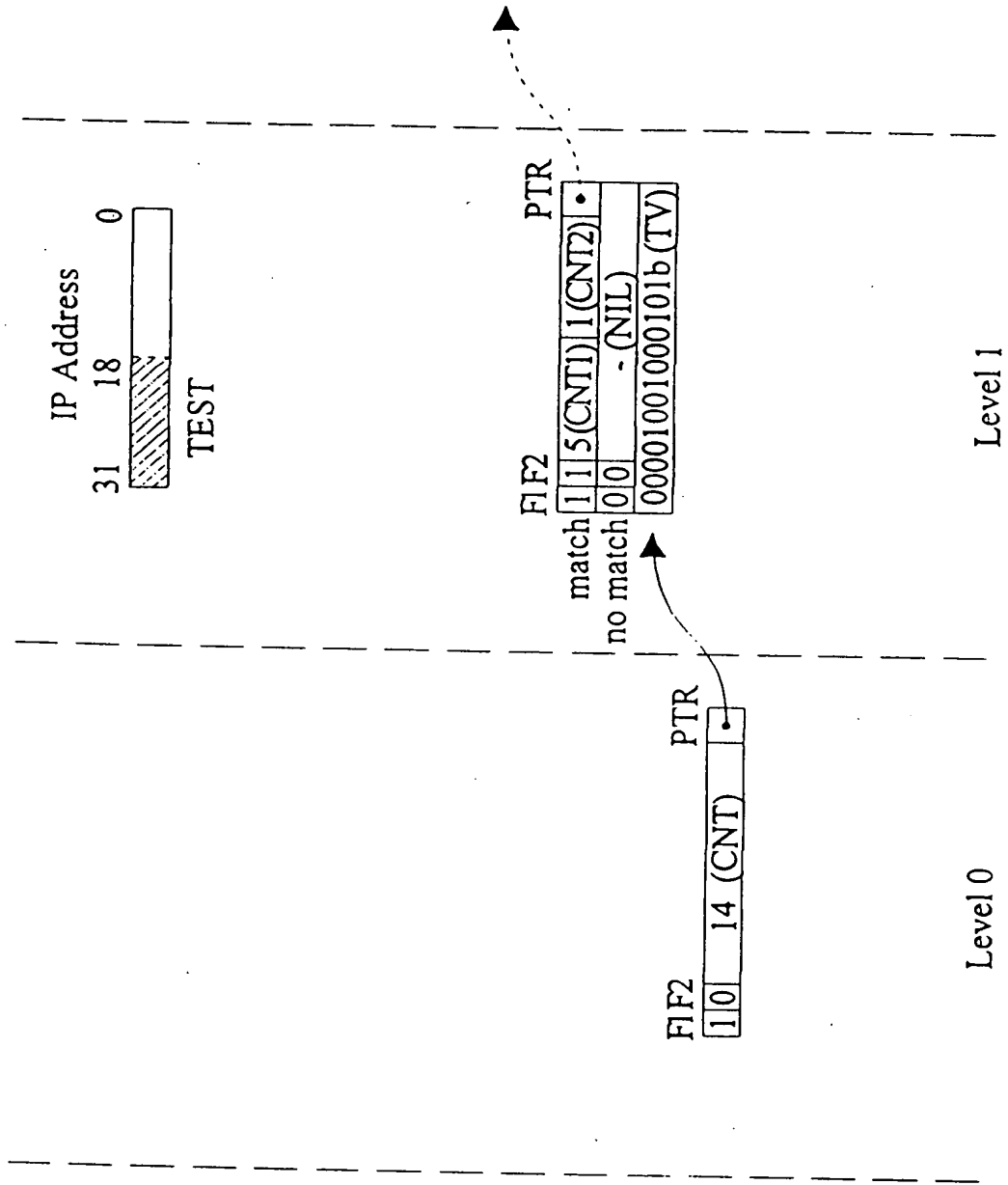


Fig.5A

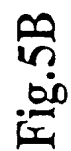


Fig. 5B

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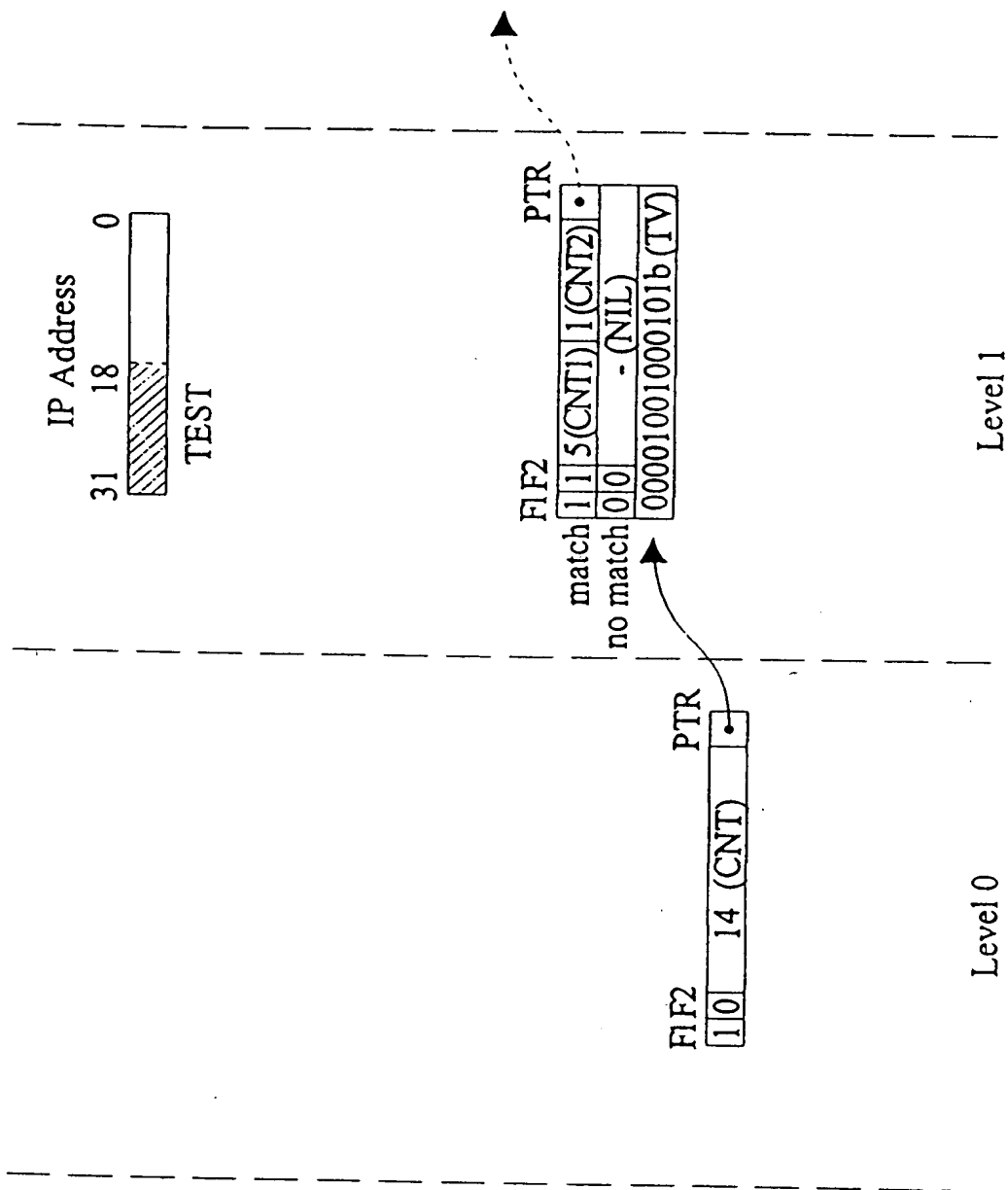
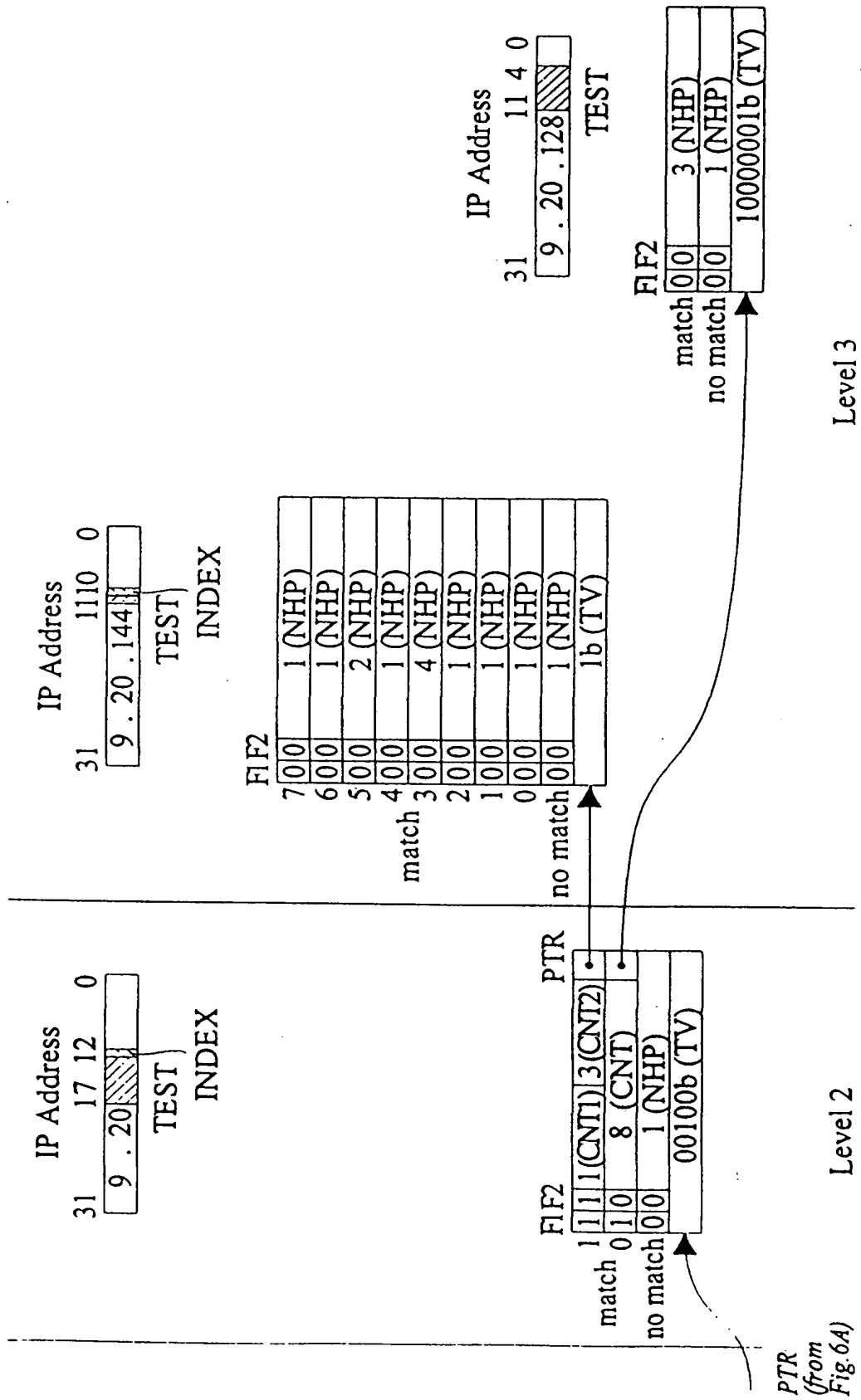


Fig.6A



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Prefix		Bit vector
A	9.20/14	<u>0000 1001 0001 01</u>
B	9.20.157/24	0000 1001 0001 01 <u>00 1001 1101</u>
C	9.20.136.16/28	0000 1001 0001 0100 1000 <u>1000 0001</u>
D	9.20.155/24	0000 1001 0001 0100 1001 <u>1011</u>

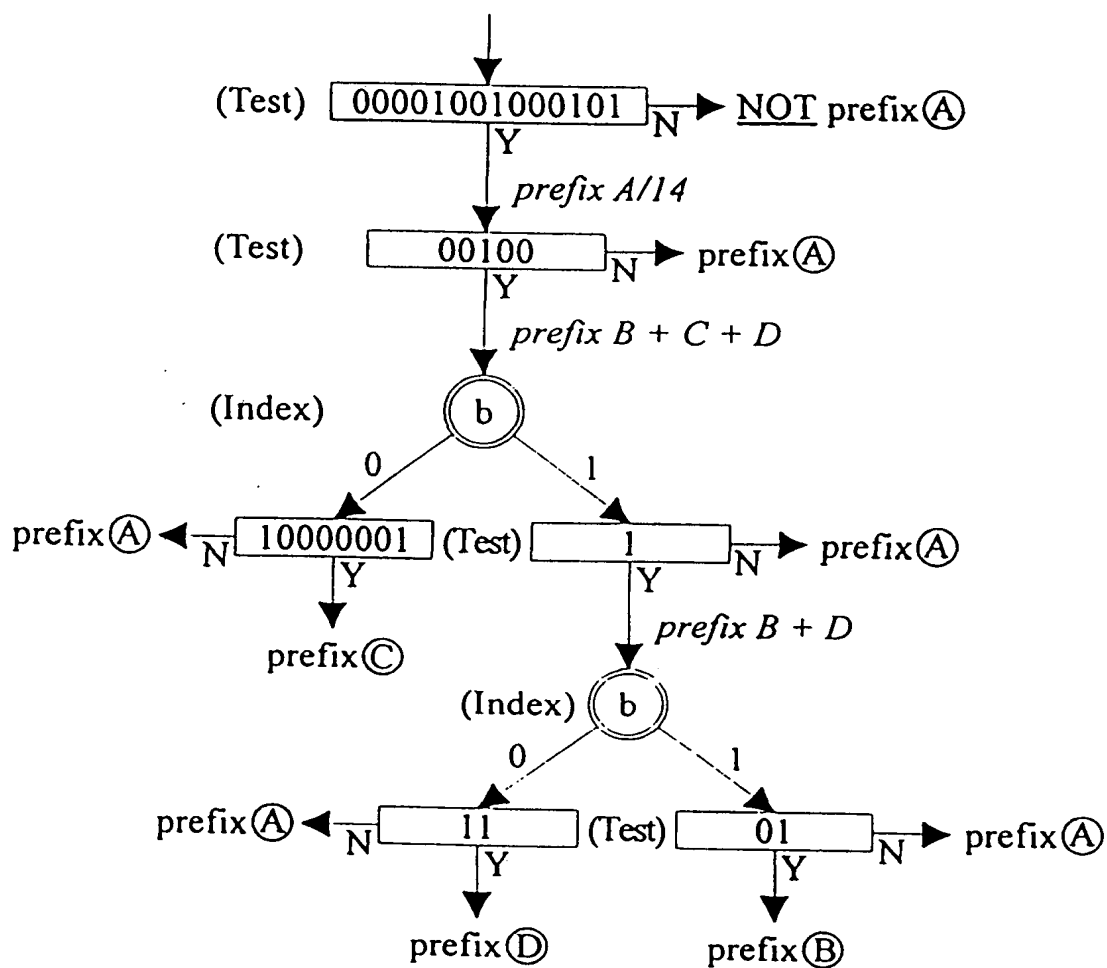


Fig.7

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Prefix		Bit vector
A	9.20/14	<u>0000 1001 0001 01</u>
B	9.20.157/24	<u>0000 1001 0001 0100 1001 1101</u>
C	9.20.136.16/28	<u>0000 1001 0001 0100 1000 1000 0001</u>
D	9.20.155/24	<u>0000 1001 0001 0100 1001 1011</u>

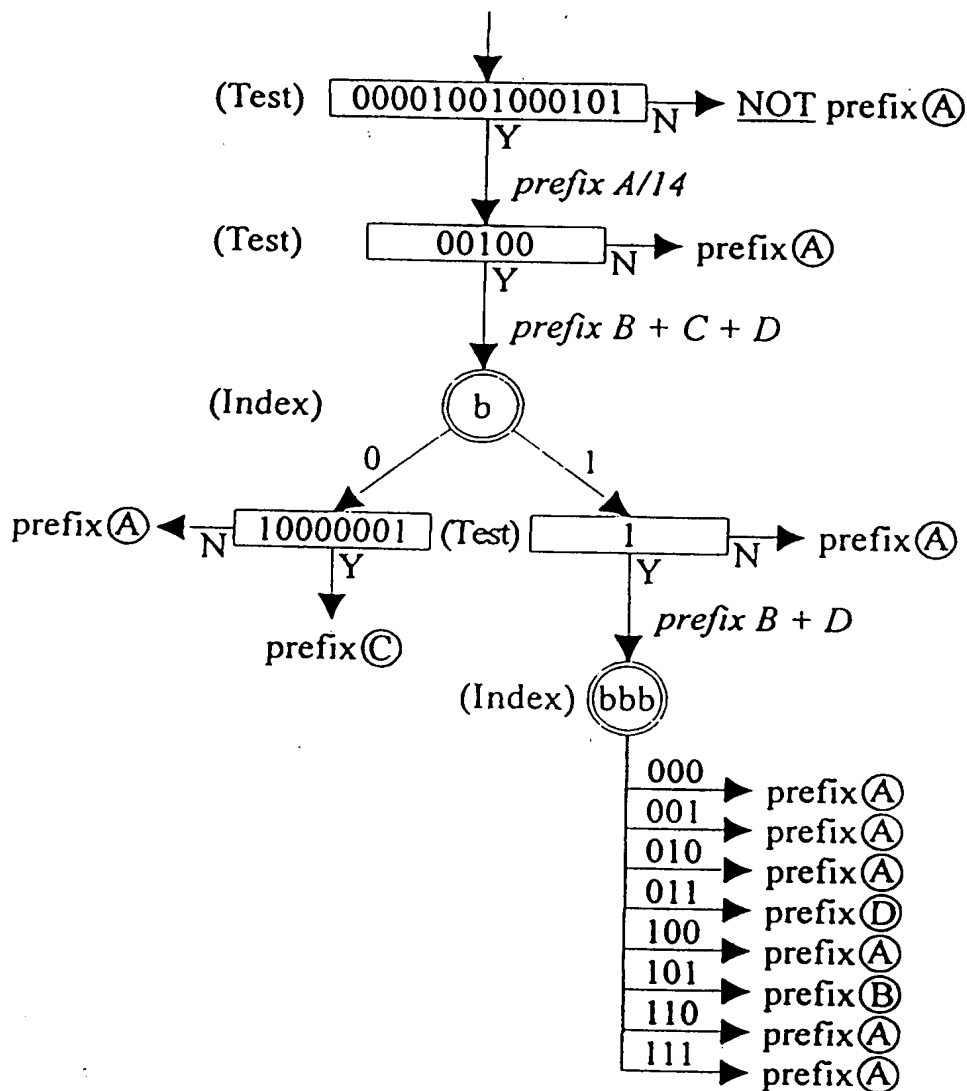


Fig.8